



Remarks

A request for extension of time to respond to the Office Action mailed February 6, 2001 is respectfully requested. Filed herewith is a Request for Extension of Time Pursuant to 37 CFR 1.136a.

Claims 3 and 10-21 are currently pending in the application. Claims 4-9 have been withdrawn from consideration as being drawn to a nonelected species. Claims 3 and 10-22 stand rejected under 35 USC 103(a) and 35 USC 112. Claim 10 also stands rejected under 35 USC 102.

This response addresses the issues raised by the Examiner in the Office Action.

Claim 22 – 35 USC 112, first paragraph

The rejection of claim 22 under 35 USC 112, first paragraph as lacking support and containing new matter is respectfully traversed. The Examiner takes the position that lines 5-7 and 9-11 of claim 22, relating to reacting with sulfuric acid are a recitation of new matter. Applicant respectfully disagrees.

In reviewing the past amendment, it was noted that the language “separating and removing fluorine values from the ore residue by” in lines 5-7 was modifying the incorrect process step. Applicant has corrected claim 22 to place this language in step c.

Support for claim 22 may be found throughout the present Specification. For example, as described on pages 17 and 18, Figure 2 of the Specification depicts an embodiment of a process of the present invention comprising in reactor 40, “reacting the ore residue with a sulfuric acid solution to solubilize at least a portion of the tantalum or niobium metal values from the ore residue and produce an undissolved material” and further comprising in sulfator 42, “reacting the undissolved material with sulfuric acid for a period of time, and under temperature and pressure conditions sufficient to liberate hydrogen fluoride gas and to generate a sulfated material.”

In view of this support in the specification and Figures, the Examiner is respectfully requested to withdraw the rejection of claim 22, under 35 USC 112, first paragraph.

Claims 3 and 10-22 – 35 USC 112, second paragraph

The rejection of claims 3 and 10-22 under 35 USC 112, second paragraph is respectfully traversed.

Claims 3 and 10-22 have been amended to clarify the relationship among the process steps and the components utilized therein. For example, claims 16 and 17 noted by the Examiner have been made clearer by reciting a “first mineral acid” and a “second mineral acid”. In addition steps in the process have been labeled to further clarify the relationship among the independent and dependent claims.

For these reasons, the Examiner is respectfully requested to withdraw the rejection of claims 3 and 10-22 under 35 USC 112, second paragraph.

Claim 10 – 35 USC 102(b or e) or 103

The rejection of claim 10 as anticipated by, under 35 USC 102(b or e), or as obvious in view of each of Harbuck et al. and Carlson ‘970 is respectfully traversed.

Harbuck et al. present a general overview regarding options for separating scandium from a tantalum-niobium waste material. The Examiner cites pages 109-110, 114-115 and 116 of Harbuck et al. as, in the Examiner’s opinion, teaching the extraction of scandium with “strong sulfuric acid,” “DEHPA” and “NaOH”. The disclosure in Harbuck, however, is deficient to anticipate claim 10. Harbuck fails to specifically disclose the process step of separating and removing fluorine values from the disclosed source material. Further, Harbuck contains no suggestion relating to the removal of fluorine values that would lead one of ordinary skill in the art to arrive at the process of claim 10.

Carlson ‘970 is similarly deficient. The examiner refers to Example E in Carlson ‘970. Example E describes a method for extracting scandium from a liquor resulting from the digestion of Tantalum/Niobium Leach residues. The disclosed process involves mixing the product liquor with an organic extractant and then stripping the desired metal values from the organic phase. In contrast, claim 10 specifies a method wherein scandium values are solubilized into an aqueous phase instead of an organic phase. Extraction into an aqueous phase is fundamentally different than extraction into an organic phase. The polar solvating capabilities of an aqueous solution will allow for a more complete extraction and precipitation of metal scandium values. Changing

from an organic phase based extraction to an aqueous phase based extraction is a fundamental change and not one that is predictable based on this prior art. Moreover, a transition from an organic extraction to an aqueous one is not a variation of a parameter since the two extraction methods vary widely by focusing on different aspects of solubility. Thus, Carlson '970 fails to disclose or suggest the process of claim 10.

For these reasons, the Examiner is respectfully requested to withdraw the rejection of claim 10 under 35 USC 102(b or e) or 35 USC 103.

Claims 3 and 10-22 – 35 USC 103(a)

The rejection of claims 3 and 10-22 under 35 USC 103(a) as unpatentable over Carlson '970 is respectfully traversed.

As discussed above, Carlson '970 discloses a process utilizing organic solvents. One of ordinary skill in the art would not seek to modify the process disclosed by Carlson '970 to arrive at the presently claimed process. Organic solvents have elevated boiling points. A solvent with an elevated boiling point is advantageous to the process disclosed in Carlson '970 since the leaching often takes place at high temperatures. The high temperatures taught by Carlson '970 would limit the use of an aqueous solvent. Therefore, an optimization of the '970 extracting technique would not be to substitute an aqueous solvent. Rather, an optimization could be a switch to an organic solvent with a higher boiling point. Changing from an organic phase based extraction to an aqueous phase based extraction is a fundamental change and not one that is suggested to one of ordinary skill in the art by the disclosure in Carlson '970. Moreover, a transition from an organic extraction to an aqueous one is not a variation of a parameter since the two extraction methods vary widely by focusing on different aspects of solubility and reaction conditions.


For these reasons, the process disclosed in Carlson '970 would not suggest the present claimed processes to one of ordinary skill in the art. Thus, the Examiner is respectfully requested to withdraw the rejection of claims 3 and 10-22 under 35 USC 103(a).

Conclusion

A favorable Office Action is respectfully solicited. The Examiner is invited to contact the undersigned at 336.607.7315 to discuss any matter relating to this application.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Amendments in the Claims:

In accordance with 37 CFR 1.121(b), the following claims show all the changes made by the foregoing amendments relative to the previous versions of the claims (additions underlined; deletions [bracketed]).

Claims 3 and 10-22 have been amended.

3. (Amended) The process of claim 21 wherein the step d) of leaching the sulfated material further comprises:

d1) reacting the sulfated material with water for a period of time, and under temperature and pressure conditions sufficient to generate said aqueous solution comprising the one or more other solubilized metal values; and

d2) filtering said aqueous solution comprising the one or more other solubilized metal values to separate remaining material solids from said aqueous solution.

Claim 10. (Amended) A process for selectively extracting scandium values from a source material which includes solubilizable scandium values, the process comprising the steps of:

a) leaching the source material to solubilize scandium values contained in the source material and generate an aqueous solution comprising said solubilized scandium values and a solid phase at least partially depleted in scandium; and

b) selectively extracting a scandium value from said aqueous solution.

11. (Amended) The process of claim 10 wherein the source material further comprises fluorine, tantalum and/or niobium and step a) [the process] further comprises the steps of:

a1) reacting the source material with a solution of a first mineral acid for a period of time, and under temperature and pressure conditions sufficient, to solubilize at least a portion of tantalum and niobium from the starting material and create a solution comprising tantalum and

niobium metal values and a solids residue comprising fluorine and scandium metal values, and at least partially depleted in tantalum and niobium metal values;

a2) separating and drying the solids residue

a3) reacting the solids residue with a second mineral acid comprising sulfuric acid for a period of time, and under temperature and pressure conditions sufficient, to liberate hydrogen fluoride gas and to generate a sulfated material comprising scandium metal values and at least partially depleted in fluorine metal values; and

a4) leaching the sulfated material to solubilize scandium metal values contained in the sulfated material and generate said aqueous solution comprising scandium metal values and a solid phase at least partially depleted in scandium.

12. (Amended) The process of claim 11 wherein the step a4) of leaching the sulfated material comprises the steps of:

a4a) reacting the sulfated material with water for a period of time, and under temperature and pressure conditions sufficient to generate said aqueous solution comprising solubilized scandium metal values; and

a4b) filtering said aqueous solution comprising solubilized scandium metal values to separate remaining material solids from said aqueous solution.

13. (Amended) The process of claim 12 wherein the step b) of selectively extracting a scandium metal value from said aqueous solution comprising solubilized scandium metal values comprises the steps of:

b1) contacting said aqueous solution comprising solubilized scandium metal values with an organic medium which includes a diluent and an extractant, said diluent being immiscible with said aqueous solution, thereby producing an organic phase comprising scandium metal values and an aqueous raffinate phase at least partially depleted in scandium metal values;

b2) separating said organic phase from said raffinate phase;

b3) stripping scandium from said organic phase by contacting said organic phase with a scandium stripping agent, said scandium stripping forming a phase comprising scandium from

said resultant organic phase and an aqueous phase comprising said scandium stripping agent and a final organic phase.

14. (Amended) A process for selectively extracting scandium metal values from a source material comprising scandium, fluorine, tantalum and/or niobium metal values the process comprising the steps of:

a) reacting the source material with a solution of a first mineral acid for a period of time, and under temperature and pressure conditions sufficient to solubilize tantalum and niobium into solution and thereby generate a solution comprising tantalum and/or niobium metal values, and a remaining material at least partially depleted in tantalum and/or niobium and comprising fluorine and/or scandium metal values;

b) separating and drying the remaining material;

c) reacting the remaining material with a second mineral acid for a period of time, and under temperature and pressure conditions sufficient to liberate hydrogen fluoride gas and to generate a sulfated material at least partially depleted in fluorine metal values and comprising scandium metal values;

d) reacting the sulfated material with water for a period of time, and under temperature and pressure conditions sufficient to generate an aqueous solution comprising scandium metal values;

e) filtering said aqueous solution comprising scandium metal values to separate remaining material solids from the aqueous solution;

f) contacting said aqueous solution resulting from step e) comprising solubilized scandium metal values with an organic medium which includes a diluent and an extractant, said diluent being immiscible with said aqueous solution resulting from step e), thereby producing an organic phase comprising scandium metal values and an aqueous raffinate phase at least partially depleted in scandium metal values;

g) separating said organic phase from step f) comprising scandium metal values from said raffinate phase at least partially depleted in scandium metal values;

h) stripping scandium metal values from said organic phase by contacting said [resultant] organic phase from step g) with a scandium stripping agent, said stripping forming a scandium phase comprising scandium metal values from said organic phase, an aqueous phase comprising said scandium stripping agent and a final organic phase comprising said diluent and said extractant.

15. (Amended) A process for selectively extracting scandium metal values from a sulfated starting material which includes scandium [the] metal values comprising the steps of:

a) reacting the sulfated material with water for a period of time, and under temperature and pressure conditions sufficient to generate an aqueous solution comprising scandium metal values;

b) filtering said aqueous solution comprising scandium metal values from step a) to separate [remaining] material solids from the aqueous solution;

c) contacting said aqueous solution from step b) comprising solubilized scandium metal values with an organic medium which includes a diluent and an extractant, said diluent being immiscible with said aqueous solution, thereby producing an organic phase comprising scandium metal values and an aqueous raffinate phase at least partially depleted in scandium metal values;

d) separating said organic phase comprising scandium metal values generated in step c) from said raffinate phase at least partially depleted scandium metal values;

e) stripping scandium metal values from said organic phase by contacting said [resultant] organic phase from step d) with a scandium stripping agent, said stripping forming a scandium phase comprising scandium metal values from said organic phase, an aqueous phase comprising said scandium stripping agent and a final organic phase comprising said diluent and said extractant.

16. (Amended) The process of claim 10 wherein the source material in step a) is an ore residue further comprising fluorine, tantalum and/or niobium and step a) [the process] further comprises the steps of:

a1) reacting the ore residue with a solution of a first mineral acid for a period of time, and under temperature and pressure conditions sufficient, to solubilize at least a portion of tantalum and niobium from the source material and create a solution comprising tantalum and niobium metal values and a solids residue comprising fluorine and scandium metal values and at least partially depleted in tantalum and niobium metal values;

a2) separating and drying the solids residue generated in step a1);

a3) reacting the solids residue from step a2) with a second mineral acid comprising sulfuric acid for a period of time, and under temperature and pressure conditions sufficient, to liberate hydrogen fluorine gas and to generate a sulfated material comprising scandium metal values and at least partially depleted in fluorine metal values; and

a4) and leaching the sulfated material to solubilize scandium metal values contained in the sulfated material and generate said aqueous solution comprising scandium metal values and a solid phase at least partially depleted in scandium metal values.

17. (Amended) The process of claim 16 wherein the first mineral acid in step a1) comprises sulfuric acid.

18. (Amended) The process of claim 17 wherein the step b) of extracting a scandium metal value from said aqueous solution comprises:

b1) contacting said aqueous solution with an organic medium which includes a diluent and an extractant, said diluent being immiscible with said aqueous solution thereby producing an organic phase comprising scandium metal values and a raffinate at least partially depleted in scandium metal values; and

b2) contacting said organic phase generated in step b1) with a scandium stripping agent to form a scandium phase comprising at least a portion of the scandium metal values present in said organic phase; an additional aqueous phase comprising said scandium stripping agent; and a final organic phase at least partially depleted in scandium metal values.

19. (Amended) The process of claim 18 wherein the organic medium of step b1) comprises DEPHA (Di 2-ethylhexylphosphoric acid) as an extractant and an aliphatic non-soluble C9-c16 hydrocarbon as a diluent.

20. (Amended) The process of claim 19 wherein the scandium stripping agent of step b2) comprises [comprising] sodium hydroxide.

21. (Amended) A process for selectively extracting a metal value from a source material which includes fluorine and one or more solubilizable metal values, the solubilizable metal values including tantalum or niobium metal values, the process comprising the steps of:

a) reacting the source material with a solution of a first mineral acid for a period of time, and under temperature and pressure conditions sufficient, to solubilize at least a portion of the tantalum or niobium metal values from the source material;

b) separating and drying the undissolved material;

c) reacting the undissolved material from step b) with a second mineral acid comprising sulfuric acid for a period of time, and under temperature and pressure conditions sufficient to liberate hydrogen fluoride gas and to generate a sulfated material;

d) leaching the sulfated material from step c) to solubilize at least a portion of the metal values contained therein and generate an aqueous solution comprising said solubilized metal values and a solid phase at least partially depleted in the solubilized metal values; and

e) selectively extracting a solubilized metal value from said aqueous solution.

22. (Amended) A process for selectively extracting a scandium metal value from an ore residue from a tantalum production process which includes fluorine, scandium and one or more additional solubilizable metal values, the additional solubilizable metal values include [including] tantalum or niobium metal values, the process comprising the steps of:

a) [separating and removing fluorine values from the ore residue by] reacting the ore residue with a sulfuric acid solution to solubilize at least a portion of the tantalum or niobium metal values from the ore residue and produce an undissolved material;

b) separating the undissolved material from step a);

c) separating and removing fluorine values from the ore residue by reacting the undissolved material from step b) with sulfuric acid for a period of time, and under temperature and pressure conditions sufficient to liberate hydrogen fluoride gas and to generate a sulfated material;

d) leaching the sulfated material from step c) in water to solubilize at least a portion of the scandium metal values contained therein and generate an aqueous solution comprising said solubilized scandium metal values and a solid phase at least partially depleted in the scandium solubilized metal values;

e) selectively extracting solubilized scandium metal values from said aqueous solution generated in step d) by contacting said aqueous solution with a sodium hydroxide stripping agent to produce a solid phase comprising scandium metal values and separating the solid phase from the remaining aqueous solution; and

f) drying and recovering the scandium metal values.